

**THE OFFICE OF REGULATORY STAFF
SURREBUTTAL TESTIMONY
OF
DR. J. RANDALL WOOLRIDGE**



DOCKET NO. 2006-97-WS

**Application of Tega Cay Water Service,
Incorporated for Adjustment of Rates and
Charges and Modifications to Certain Terms and
Conditions for the Provision of Water and Sewer
Service**

1 **Q. PLEASE STATE YOUR FULL NAME, ADDRESS, AND OCCUPATION.**

2 A. My name is J. Randall Woolridge and my business address is 120 Haymaker Circle, State
3 College, PA 16801. I am a Professor of Finance and the Goldman, Sachs & Co. and Frank P. Smeal
4 Endowed University Fellow in Business Administration at the University Park Campus of the
5 Pennsylvania State University.

6 **Q. HAVE YOU PREVIOUSLY FILED TESTIMONY IN THIS HEARING?**

7 A. Yes. I have filed testimony on behalf of the Office of Regulatory Staff ("ORS") concerning
8 an overall fair rate of return or cost of capital for Tega Cay Water Service Co. ("Tega Cay" or
9 "Company").

10 **Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY IN THIS**
11 **PROCEEDING?**

12 A. I am addressing issues covered in the Rebuttal Testimony of Tega Cay witness Ms. Pauline
13 M. Ahern.

14 **Q. WHAT ISSUES ARE YOU ADDRESSING IN YOUR SURREBUTTAL**
15 **TESTIMONY?**

16 A. I am evaluating the ROE – market-to-book relationship, betas and the riskiness of the water
17 utility industry, the equity risk premium, the size premium, the DCF growth rate, the arithmetic
18 versus geometric mean, and the ECAPM.

1 **The ROE – Market-to-Book Relationship**

2 **Q. PLEASE EVALUATE MS. AHERN’S DISCUSSION OF THE RELEVANCE OF**
3 **MARKET-TO-BOOK RATIOS.**

4 A. In her rebuttal testimony Ms. Ahern discusses the relationship between return on equity and
5 market-to-book ratios. Ms. Ahern’s discussion and analysis on this topic is overly simplistic. On a
6 day-to-day basis, stock prices are influenced by many factors in the marketplace. On some days,
7 such factors as program trading, acquisitions, and other news events drive stock prices. However,
8 over time, and in the context of the issues relevant in these proceedings, there is a very direct
9 relationship between stock price, book value, and the return on and cost of equity. This relationship
10 is discussed in a classic Harvard Business School case study entitled “A Note on Value Drivers.”
11 On page 2 of that case study, the author describes the relationship very succinctly:

12
13 *For a given industry, more profitable firms – those able to generate higher returns*
14 *per dollar of equity – should have higher market-to-book ratios. Conversely, firms which*
15 *are unable to generate returns in excess of their cost of equity should sell for less than book*
16 *value.*

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19

<i>Profitability</i>	<i>Value</i>
<i>If ROE > K</i>	<i>then Market/Book > 1</i>
<i>If ROE = K</i>	<i>then Market/Book = 1</i>
<i>If ROE < K</i>	<i>then Market/Book < 1</i>

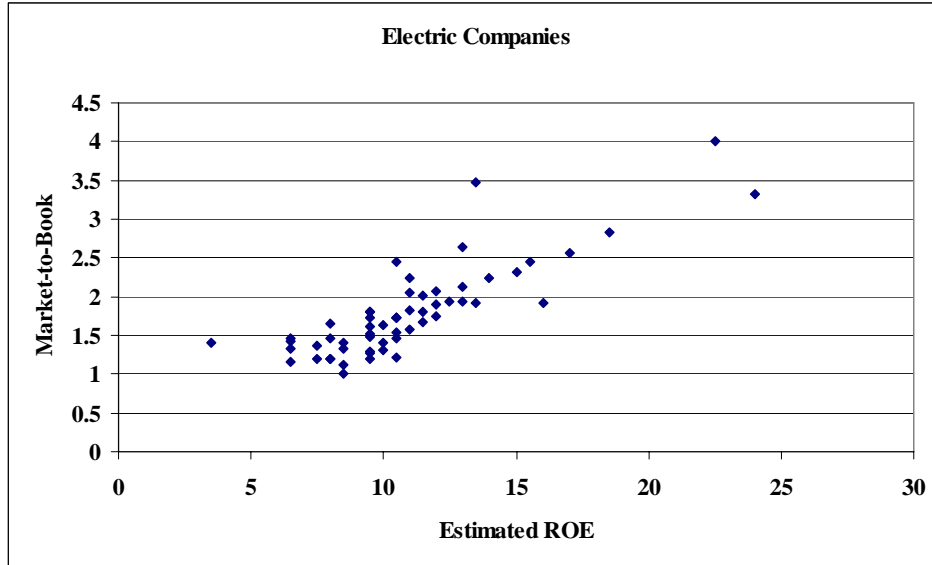
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25 Ms. Ahern’s discussion on pages 2-5 of her rebuttal testimony, and the analysis provided in
26 Schedule PMA-13, are irrelevant to this topic. Her analysis simply indicates that, over time, market-

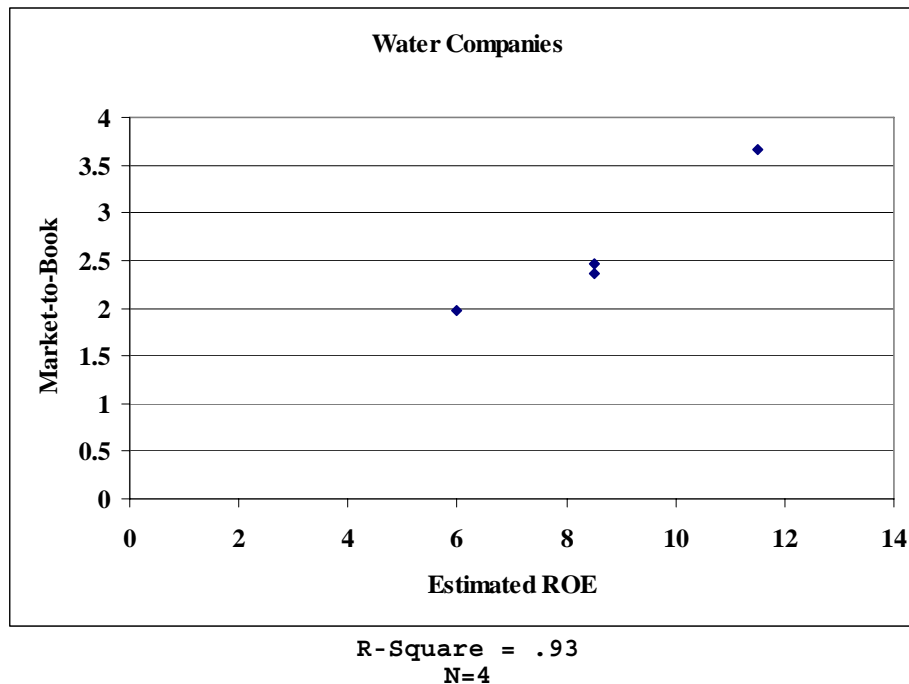
1 to-book ratios of industrial firms have been in excess of 1.0 because successful firms have been
2 earning returns on equity above their equity cost rates over time. Indeed, existing firms should be
3 earning returns on equity in excess of their equity cost rates. Ms. Ahern's analysis suffers from the
4 well-known survivorship bias. This is, only firms that have survived over time are still around.
5 Firms that cannot earn returns on equity at least as large as their equity cost rates over time will
6 either be acquired by other companies or go out of business. Therefore, the results that Ms. Ahern
7 presents and discusses are biased and are of no relevance.

8 **Q. ON PAGE 2 OF HER REBUTTAL TESTIMONY, MS. AHERN MAKES THE**
9 **FOLLOWING STATEMENT: "IN THE COMPETITIVE ENVIRONMENT, THERE IS NO**
10 **RELATIONSHIP BETWEEN MARKET-TO-BOOK RATIOS AND ROE." PLEASE**
11 **COMMENT.**

12 A. Ms. Ahern's comment is incorrect, reflects the flawed study discussed above, and
13 misunderstands basic microeconomics. To demonstrate this relationship, I have performed a
14 regression study between estimated return on equity and market-to-book ratios using all gas
15 distribution, electric and water companies with estimated return on equity and market-to-book ratio
16 data. The results are presented below.

**The Relationship Between Estimated ROE and Market-to-Book Ratios
Value Line Electrics Companies, Gas Distribution Companies, and Water Utilities**





The average R-squares for the electric, gas, and water companies are 0.70, 0.64, and 0.93. This demonstrates the strong relationship between ROEs and market-to-book ratios.

Q. PLEASE SUMMARIZE YOUR ASSESSMENT OF THE RELATIONSHIP BETWEEN MARKET-TO-BOOK RATIOS AND ROE.

A. As indicated above, the relationship between a firm's return on equity and market-to-book ratio is relatively straightforward. Ms. Ahern's analysis of the historical relationship between returns on equity and market-to-book ratios for industrial firms is erroneous and subject to survivorship bias. Using groups of electric, natural gas, water utility companies, I demonstrate that there is a strong, positive, statistically significant relationship between return on equity and market-to-book ratios.

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1 **Betas and the Riskiness of Water Utilities**

2 **Q. ON PAGE 5 OF HER REBUTTAL TESTIMONY, MS. AHERN TAKES ISSUE**
3 **WITH YOUR STUDY OF THE COMPARATIVE INVESTMENT RISK OF WATER**
4 **UTILITIES AND OTHER INDUSTRIES USING BETA. PLEASE COMMENT.**

5 A. In Exhibit (JRW-6) of my direct testimony, I show the comparative investment risk of the
6 water utility industry relative to 100 other industries as measured by beta. My study indicates
7 that the investment risk of the water utility industry is among the lowest of all industries in the
8 U.S.

9 In her rebuttal testimony, Ms. Ahern contends that beta only measures a portion of
10 investment risk and hence my study is flawed. However, Ms. Ahern's discussion of beta and
11 investment risk reflects a very basic misunderstanding of modern capital market theory. Ms.
12 Ahern and I agree that beta is a measure of the systematic risk and that this risk cannot be
13 diversified away. But Ms. Ahern also contends that the investment risk of a stock includes both
14 systematic and unsystematic risk. Unsystematic risk reflects company-specific factors which can
15 be diversified away by investors. The key principle that Ms. Ahern misses about capital market
16 theory is this: Since investors can diversify away unsystematic risk, the market does not pay a
17 return for it. As such, investors are not rewarded for bearing diversifiable risk, and therefore do
18 not expect a return on diversifiable risk. Ms. Ahern tries to confuse the issue by suggesting that
19 beta is the only relevant measure of risk with a diversified portfolio, and that for an individual

1 company or an undiversified investor, you must also provide a return for diversifiable risk. This
2 is incorrect.

3 On a more intuitive level, beta reflects the price volatility of a stock relative to the
4 market. Stocks whose price movements are greater than the overall market are riskier than the
5 market and have a beta greater than 1.0. Stocks with below-average price movements, such as
6 the stocks of public utilities, are less risky than the market and have a beta less than 1.0.

7 **The Equity Risk Premium**

8 **Q. PLEASE EVALUATE THE ISSUE REGARDING THE DECLINE IN THE EQUITY**
9 **RISK PREMIUM.**

10 A. As I discuss in my testimony, there are three approaches to estimating the equity risk
11 premium: (1) using historical stock and bond returns, (2) developing expected market returns from
12 fundamental data (primarily earnings and dividends), and (3) employing surveys of financial
13 professionals. In arriving at my equity risk premium, I use all three approaches and I provide
14 independent evidence from multiple sources regarding the decline and the size of the equity risk
15 premium. This evidence comes from leading academic scholars, the top investment banks and
16 consulting firms, surveys of chief financial officers (CFOs) and financial forecasters, and even
17 former Federal Reserve Chairman Alan Greenspan. In each case, the evidence indicates a
18 decline in the equity risk premium.

19 On pages 9-11 of her rebuttal testimony, Ms. Ahern attempts to critique my discussion

1 relating to the decline in the equity risk premium by highlighting a 1998 article by Ibbotson
2 Associates. The Ibbotson approach relies solely on historical return to estimate an equity risk
3 premium. As discussed in my testimony, the use of historical return to estimate an expected risk
4 premium can be erroneous because (1) ex post returns are not the same as ex ante expectations,
5 (2) market risk premiums can change over time, increasing when investors become more risk-
6 averse, and decreasing when investors become less risk-averse, and (3) market conditions can
7 change such that ex post historical returns are poor estimates of ex ante expectations.

8 Furthermore, there are a number of flaws in using historical returns over long time periods
9 to estimate expected equity risk premiums. These issues, as discussed in my testimony, include:
10 (1) Biased historical bond returns; (2) the arithmetic versus the geometric mean return; (3)
11 unattainable and biased historical stock returns; (4) survivorship bias; (5) the “Peso Problem;” (6)
12 market conditions today are significantly different than the past; and (7) changes in risk and return in
13 the markets.

14 **Q. ON PAGES 6-7 OF HER REBUTTAL TESTIMONY MS. AHERN TAKES**
15 **EXCEPTION TO YOUR ‘BUILDING BLOCKS’ APPROACH TO ESTIMATING AN**
16 **EQUITY RISK PREMIUM. PLEASE COMMENT.**

17 A. Ms. Ahern suggests that Ibbotson Associates *2006 Yearbook* provides a equity risk
18 premium of 7.1% using the ‘Building Blocks’ approach to estimating an equity risk premium.
19 The error in this case is that Ibbotson uses a historical “Building Blocks” approach which

1 employs historical data as inputs. For example, the current dividend yield in the market is 1.9%.
2 However, the historical dividend yield in the Ibbotson approach is 4.4%. By ignoring current
3 market conditions, this factor alone inflates the equity risk premium by 2.5%

4 **Q. DO YOU HAVE ANY FINAL COMMENTS ON THE APPROPRIATE EQUITY**
5 **RISK PREMIUM?**

6 A. Yes. The Spring 2006 Duke/*CFO Magazine* Survey was just released June 8th.¹ The CFOs
7 who respond to this survey expect an equity risk premium of 3.05% over the 10-year Treasury yield.
8 It is clear that those in the marketplace who use equity risk premiums for investment and financing
9 decision-making, such as CFOs, investment banks, and consulting firms, have a much different view
10 of the appropriate equity risk premium than Ms. Ahern.

11 **The Size Premium**

12 **Q. PLEASE RESPOND TO MS. AHERN'S UPDATED SIZE PREMIUM ANALYSIS**
13 **FOUND ON PAGES 11-14 OF HER REBUTTAL TESTIMONY.**

14 A. To support her size premium adjustment, Ms. Ahern provides an additional analysis
15 using Ibbotson Associates data. There are several problems with the reference to the Ibbotson
16 study. First, it is based entirely on historical returns, and therefore suffers from all the problems
17 outlined above about using historical returns to estimate a risk premium. Second, and most
18 importantly, the size premium she cites from the study is for a group of stocks that are riskier

¹ See www.cfosurvey.org.

1 than water utility companies. Furthermore, as noted in my testimony, a study by Professor
2 Annie Wong found that size premiums did not apply to utilities.²

3 **DCF Growth Rate**

4 **Q. PLEASE DISCUSS MS. AHERN'S EVALUATION OF THE UPWARD BIAS IN**
5 **ANALYSTS' EPS GROWTH RATE FORECASTS.**

6 A. In my direct testimony, I provide empirical evidence demonstrating an upward bias in
7 analysts' EPS growth rate forecasts. In response, Ms. Ahern produces a 2002 speech by a Director
8 of the SEC which highlights changes in rules and compliance that are aimed at eliminating conflicts
9 of interest for analysts. Ms. Ahern's presumption that the new SEC rules have eliminated the
10 upward bias in analysts' EPS growth rate forecasts is misguided and incorrect. First, it should be
11 noted that the *Wall Street Journal* article³ highlighting the continued upward bias in analysts'
12 growth rate forecasts was published after the change in the SEC rules and the speech cited by Ms.
13 Ahern. Second, as highlighted in my testimony, the average long-term EPS growth rate projected by
14 analysts is still about 15% -- about twice the actual historical growth rate of U.S. companies.

15 **Q. PLEASE ASSESS MS. AHERN'S COMMENTS REGARDING YOUR**
16 **EXAMINATION OF VALUE LINE PROJECTIONS.**

17 A. In my direct testimony, I also provide empirical evidence illustrating that *Value Line's*

² Annie Wong, "Utility Stocks and the Size Effect: An Empirical Analysis," *Journal of the Midwest Finance Association*, 1993, pp. 95-101.

³ Ken Brown, "Analysts Still Coming Up Rosy – Over-Optimism on Growth Rates is Rampant – and the Estimates

1 projections of both EPS growth rates and stock returns tend to be overly optimistic. A significant
2 factor in their inflated projections is that *Value Line* rarely forecasts negative EPS growth rates and
3 stock returns. In response, Ms. Ahern states: “Whether such forecasts have been accurate is
4 irrelevant.” Such a statement contrasts with Ms. Ahern’s belief in the Efficient Market Hypothesis
5 (EMH). Under EMH, investors would recognize the bias in *Value Line* projected EPS growth rates
6 and stock returns and moderate their growth rate and stock return expectations in recognition of the
7 tendency for *Value Line* to provide inflated forecasts.

8 **Arithmetic versus Geometric Mean Returns**

9 **Q. MS. AHERN ALSO ARGUES FOR USING THE ARITHMETIC MEAN RETURN**
10 **IN EVALUATING HISTORICAL RETURNS. PLEASE RESPOND.**

11 A. As shown on page 4 of in Exhibit_(JRW-8), I use both arithmetic and geometric mean
12 returns in assessing stock and bond returns. In my testimony I discussed this issue and presented
13 an example to highlight the problem with the arithmetic mean return. As further evidence as to
14 the appropriate mean return measure, the U.S. Securities and Exchange Commission requires
15 equity mutual funds to report historical return performance using geometric mean and not
16 arithmetic mean returns.⁴

Help to Buoy the Market’s Valuation.” *Wall Street Journal*, (January 27, 2003), p. C1.

⁴ U.S. Securities and Exchange Commission, Form N-1A.

1 **ECAPM**

2 **Q. MS. AHERN HAS CLAIMED THAT YOU HAVE MISREPRESENTED DR.**
3 **MORIN’S ‘EVIDENCE’ REGARDING THE ECAPM. PLEASE COMMENT.**

4 A. I have not misrepresented Dr. Morin’s ‘evidence’ on the ECAPM. First, I agree that tests
5 of the CAPM have indicated the Security Market Line (SML) is not as steep as predicted by the
6 CAPM. However, none of these tests use adjusted betas (such as those used by Ms. Ahern and
7 myself) which address the empirical issues with the SML. Furthermore, a SML with a slope
8 coefficient which is not as steep as predicted by the CAPM is also consistent with a declining
9 equity risk premium. Needless to say, I have provided plenty of empirical evidence regarding
10 the decline in the equity risk premium.

11 **Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?**

12 A. Yes.